OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **ARMINGTON LAKE** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a, also a measure of algal abundance, in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *variable* in-lake chlorophyll-a trend. The results for this season were higher than those seen last summer. The increase in rain we experienced this summer could have caused an increase in the amount of nutrients entering the lake through runoff from the surrounding watershed. The chlorophyll-a concentrations in the lake are still well below the NH mean. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *slightly worsening* trend in lake transparency, however, there has been a steady improvement in lake transparency since 1996, and the results are still well above the NH mean. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrients for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth

over time. The graph of the upper water layer shows a *slightly improving* trend for in-lake phosphorus levels, which means concentrations are decreasing. The graph of the lower water layer indicates a *stabilizing* trend in phosphorus levels. The hypolimnetic phosphorus results for this season were slightly elevated due to a sharp spike in July. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- **Please note** on two occasions this summer the epilimnetic and hypolimnetic phosphorus levels were found to be less than 5 µg/L. The NHDES Laboratory Services incorporated a new method of analyzing total phosphorus this year and the lowest value that can be observed is less than 5 µg/L. If this caused an increase in the average phosphorus for either of the layers we would like to remind the association that a reading of 5 µg/L is still considered low for New Hampshire's waters.

- Dissolved oxygen was again high at all depths of the lake (Table 9). As stratified lakes age, oxygen is depleted in the lower layer by the process of decomposition. The lack of this aging indicator is a sign of the lake's overall health.

- *E. coli* counts were very low during the August sampling event (Table 12). Results were either 0 or 1 counts, well below the state standard of 406 counts per 100 mL for surface waters, and 88 counts per 100 mL for swimming areas.

- The overall quality of Armington Lake remains very good. There were no increases of pollutants or nutrients to the lake this year. We applaud the residents of the watershed for helping to keep the water clean, as well as for their continued monitoring activities.

NOTES

- Monitor's Note (6/25/00): Bacteria bottles not used; tests are done end of August.

- Monitor's Note (7/23/00): Tributaries not flowing. Large brown bottle for Chlorophyll-a was missing.

USEFUL RESOURCES

Soil Erosion and Sediment Control on Construction Sites, WD-WEB-12, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

What Can You Do To Prevent Soil Erosion?, WD-BB-30, NHDES Fact Sheet. (603) 271-3503 or www.state.nh.us

A Brief History of Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

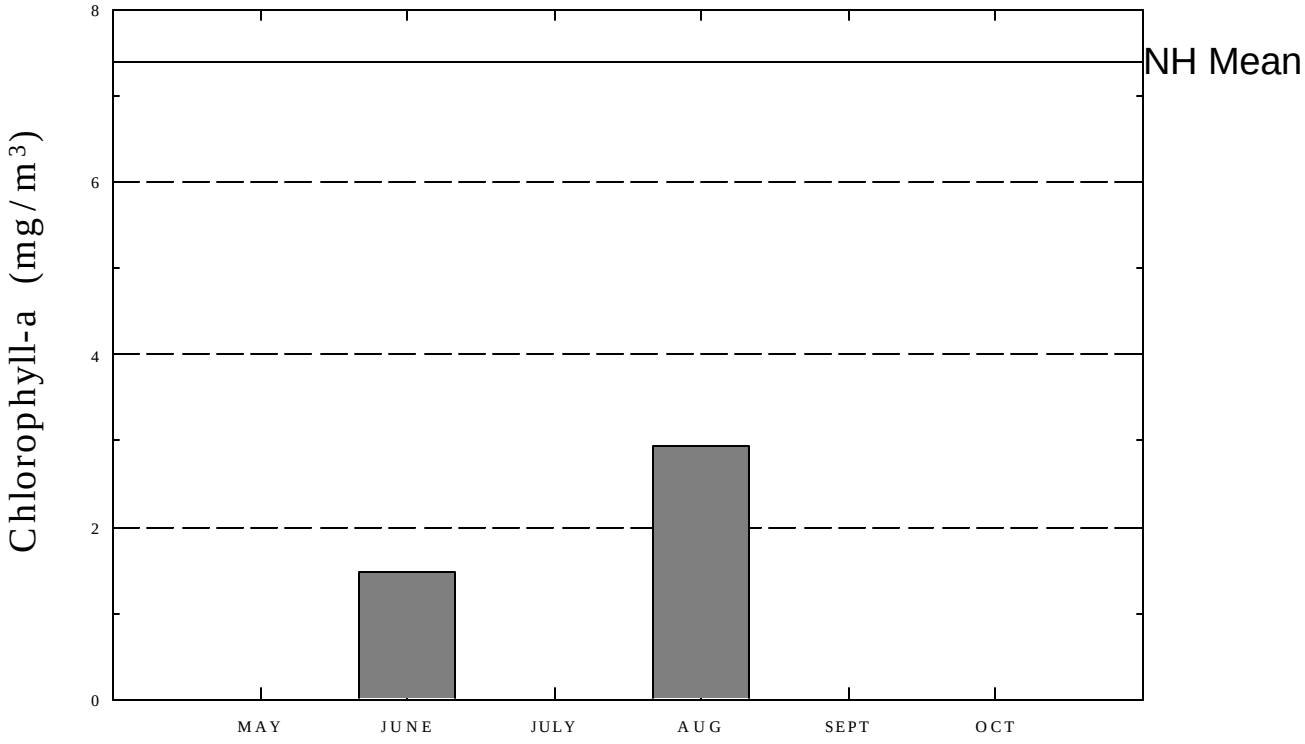
Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, WD-BB-9, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Effects of Phosphorus on New Hampshire's Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

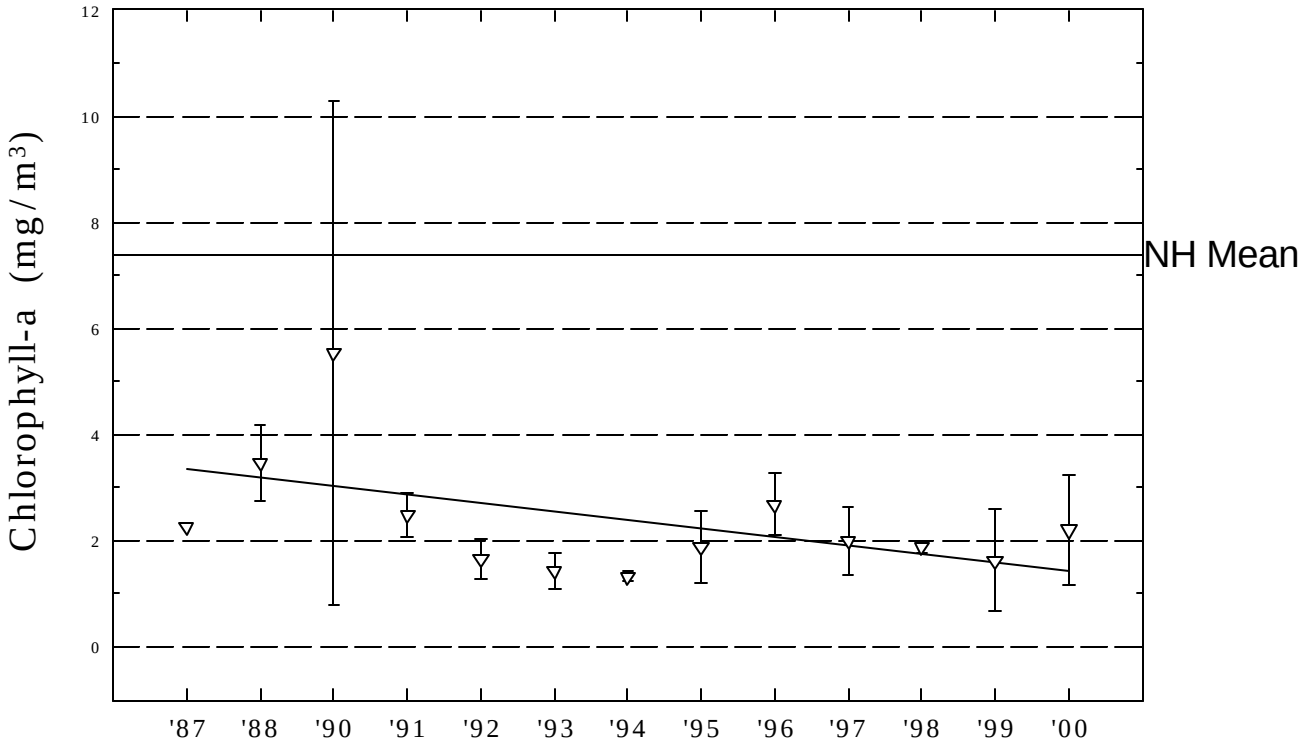
What is a Watershed?, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Armington Lake

Figure 1. Monthly and Historical Chlorophyll-a Results



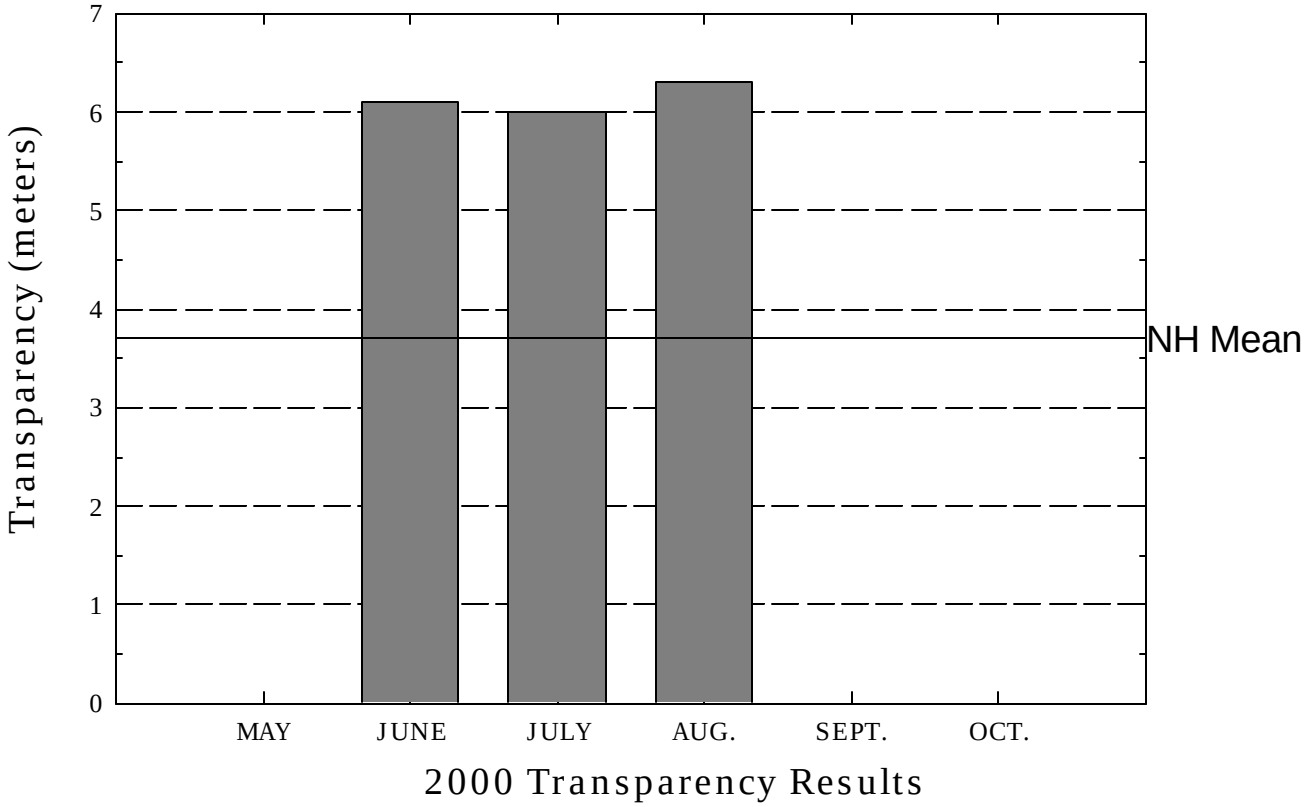
2000 Chlorophyll-a Results

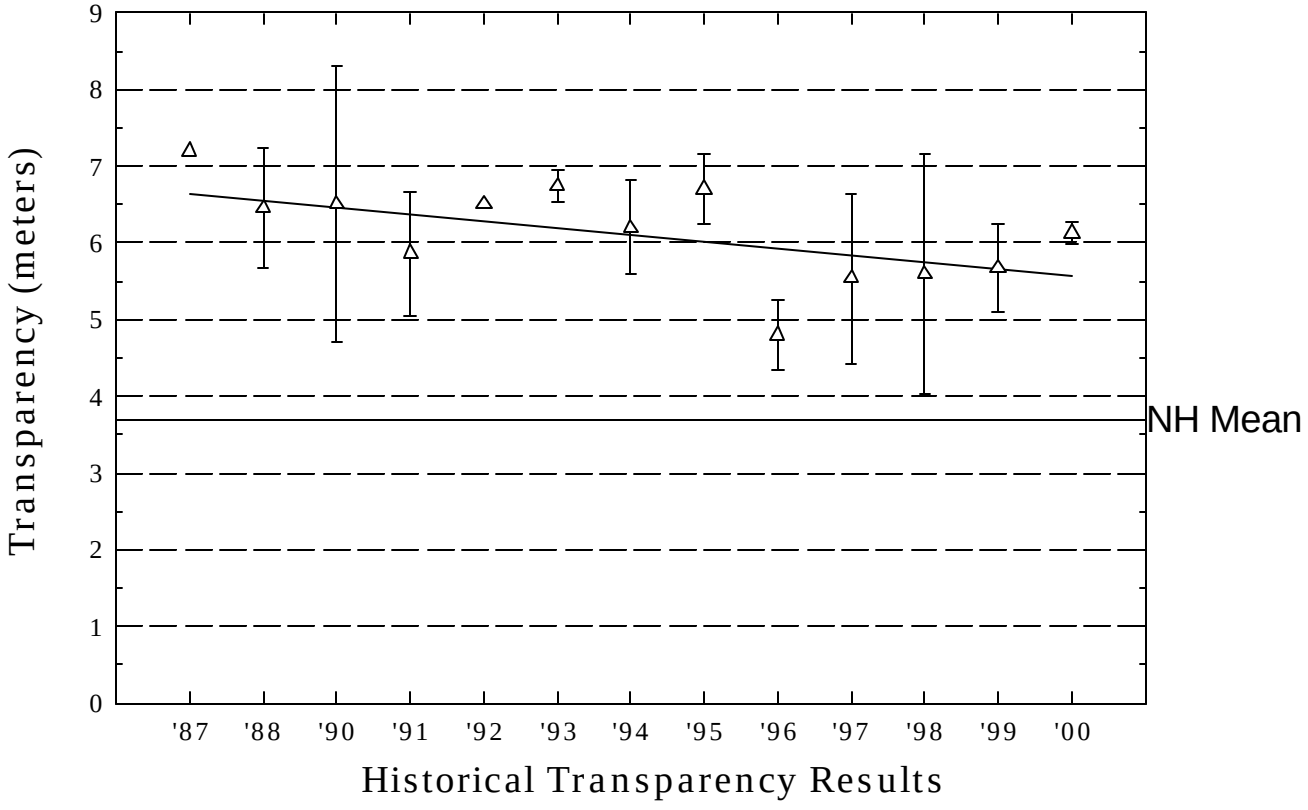


Historical Chlorophyll-a Results

Armington Lake

Figure 2. Monthly and Historical Transparency Results





Armington Lake

Figure 3. Monthly and Historical Total Phosphorus Data.

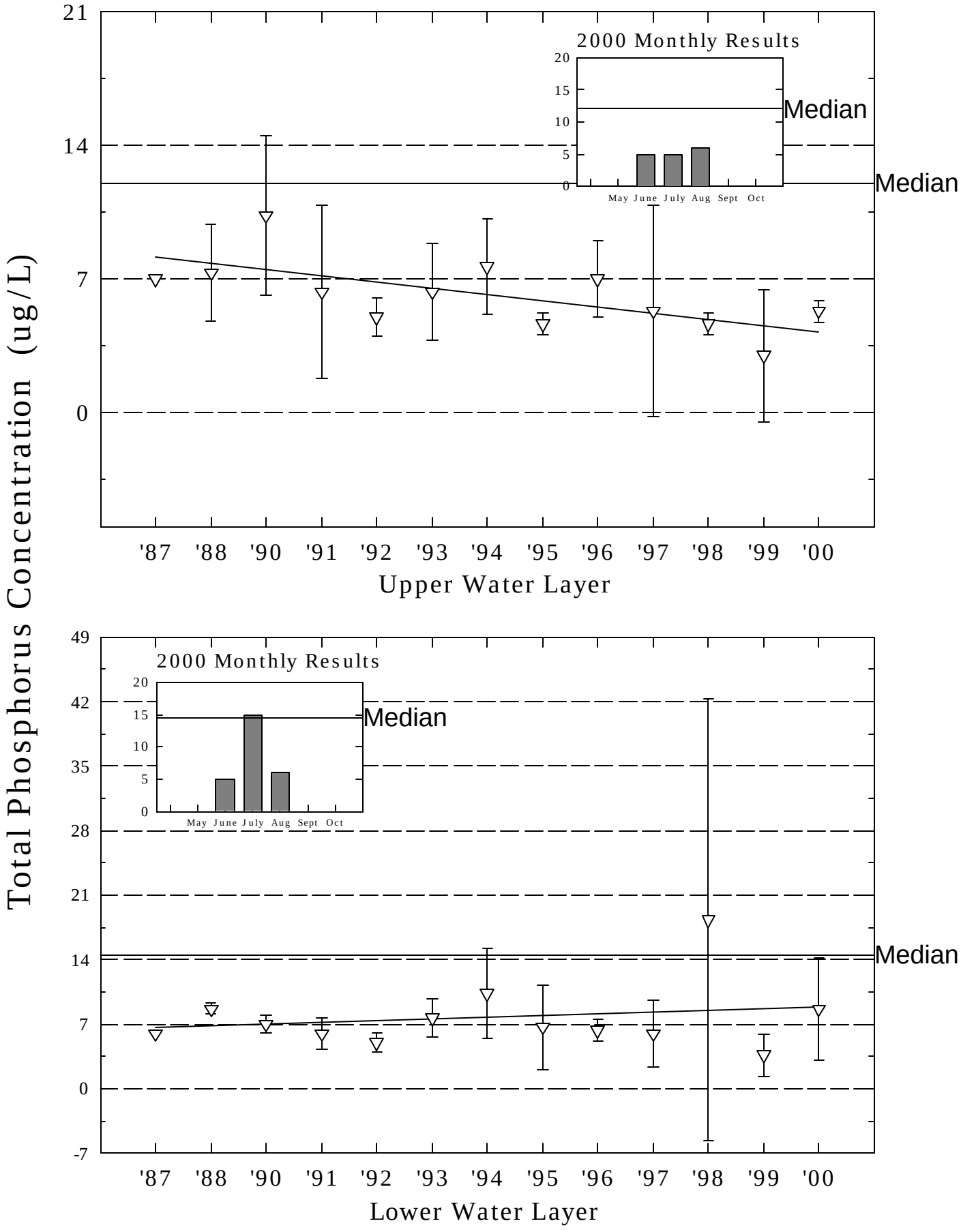


Table 1.

ARMINGTON LAKE
PIERMONT

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1987	2.26	2.26	2.26
1988	3.00	4.30	3.47
1990	2.21	10.98	5.54
1991	2.01	3.65	2.78
1992	1.28	2.04	1.66
1993	1.23	1.82	1.43
1994	1.26	1.45	1.33
1995	1.11	2.39	1.89
1996	2.02	3.08	2.68
1997	1.26	2.37	1.99
1998	1.80	2.02	1.89
1999	0.66	2.58	1.62
2000	1.47	2.94	2.20

Table 2.

ARMINGTON LAKE

PIERMONT

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/27/1987	DINOBRYON	82
06/02/1988	DINOBRYON	72
07/28/1988		19
08/24/1988		
06/12/1990	TABELLARIA	52
	DINOBRYON	23
08/05/1990		
09/09/1990		
06/17/1991	ANABAENA	
	ARTHRODESMUS	
	STAURASTRUM	
07/14/1991		
08/12/1991	CHRYSOSPHAERELLA	57
	MALLOMONAS	31
08/25/1991		

Table 2.

ARMINGTON LAKE

PIERMONT

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/27/1987	DINOBRYON	82
06/02/1988	DINOBRYON	72
06/12/1990	TABELLARIA	52
	DINOBRYON	23
08/12/1991	CHRYSOSPHAERELLA	57
	MALLOMONAS	31
06/22/1992	DINOBRYON	80
	CERATIUM	10
06/09/1993	DINOBRYON	99
07/21/1994	DINOBRYON	98
07/13/1995	DINOBRYON	46
	STAURASTRUM	29
	ARTHRODESMUS	7
06/18/1996	DINOBRYON	79
	UROGLENOPSIS	21
07/29/1997	DINOBRYON	48
	UROGLENOPSIS	28
	STAURASTRUM	10
07/28/1998	DINOBRYON	84
	CHRYSOSPHAERELLA	13

Table 2.

ARMINGTON LAKE

PIERMONT

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
08 / 18 / 1999	STAURASTRUM	72
	DINOBRYON	8
	TABELLARIA	7
08 / 18 / 2000	DINOBRYON	75
	TABELLARIA	18
	STAURASTRUM	2

Table 3.

ARMINGTON LAKE

PIERMONT

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1987	7.2	7.2	7.2
1988	**.*	7.0	37.3
1990	4.5	8.0	6.5
1991	5.0	6.6	5.8
1992	**.*	6.5	68.1
1993	6.5	6.9	6.7
1994	5.8	6.9	6.2
1995	6.2	7.1	6.7
1996	4.3	5.2	4.8
1997	4.7	6.8	5.5
1998	3.8	6.6	5.6
1999	5.2	6.3	5.6
2000	6.1	6.3	6.2

Table 3.

ARMINGTON LAKE

PIERMONT

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1987	7.2	7.2	7.2
1988	5.9	7.0	6.4
1990	4.5	8.0	6.5
1991	5.0	6.6	5.8
1992	6.5	6.5	6.5
1993	6.5	6.9	6.7
1994	5.8	6.9	6.2
1995	6.2	7.1	6.7
1996	4.3	5.2	4.8
1997	4.7	6.8	5.5
1998	3.8	6.6	5.6
1999	5.2	6.3	5.6
2000	6.0	6.3	6.1

Table 4.

ARMINGTON LAKE

PIERMONT

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
510				
	1997	6.81	6.81	6.81
EPILIMNION				
	1987	6.49	6.49	6.49
	1988	6.35	6.93	6.53
	1990	6.35	6.68	6.47
	1991	6.60	6.81	6.72
	1992	6.40	7.01	6.56
	1993	6.51	6.69	6.57
	1994	6.26	6.82	6.52
	1995	6.55	7.00	6.68
	1996	6.04	6.60	6.28
	1997	6.43	6.71	6.59
	1998	6.38	6.52	6.44
	1999	6.55	7.32	6.82
	2000	6.26	6.59	6.45
HYPOLIMNION				
	1987	6.46	6.46	6.46
	1988	6.34	6.92	6.53
	1990	6.27	6.83	6.42
	1991	6.30	6.84	6.60
	1992	6.56	7.02	6.69
	1993	6.47	6.58	6.52
	1994	6.19	6.59	6.34
	1995	6.34	6.64	6.51

Table 4.

ARMINGTON LAKE

PIERMONT

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1996	6.10	6.27	6.15
	1997	5.99	6.62	6.27
	1998	6.12	6.17	6.14
	1999	6.40	6.75	6.61
	2000	6.11	6.51	6.33
INLET				
	1987	6.54	6.54	6.54
	1988	6.21	6.65	6.45
	1990	6.20	6.20	6.20
	1998	5.15	5.27	5.23
	2000	6.45	6.45	6.45
METALIMNION				
	1990	6.30	6.75	6.47
	1992	6.47	7.07	6.67
	1993	6.51	6.57	6.54
	1994	6.09	6.70	6.37
	1995	6.43	6.73	6.58
	1996	5.18	6.08	5.43
	1997	6.55	6.60	6.57
	1998	6.32	6.32	6.32
	1999	6.74	6.74	6.74
	2000	6.56	6.58	6.57
OUTLET				
	1987	6.43	6.43	6.43
	1988	6.10	6.58	6.34
	1990	6.31	6.91	6.43

Table 4.

ARMINGTON LAKE

PIERMONT

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1991	6.50	6.86	6.61
	1992	6.64	6.64	6.64
	1993	6.48	6.48	6.48
	1994	6.04	6.77	6.25
	1995	6.57	6.57	6.57
	1996	6.23	6.36	6.29
	1997	6.33	6.45	6.39
	1998	6.24	6.27	6.25
	2000	6.46	6.53	6.49

Table 5.

ARMINGTON LAKE

PIERMONT

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1987	3.40	3.40	3.40
1988	3.90	4.90	4.40
1990	2.50	3.10	2.73
1991	2.90	4.70	3.58
1992	3.00	3.30	3.17
1993	2.40	3.40	2.87
1994	2.90	3.10	3.00
1995	2.90	3.80	3.28
1996	1.80	3.80	2.70
1997	2.50	3.30	2.83
1998	2.30	2.80	2.57
1999	3.10	3.70	3.30
2000	3.00	3.30	3.20

Table 6.

ARMINGTON LAKE
PIERMONT

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
510				
	1997	53.9	53.9	53.9
EPILIMNION				
	1987	30.5	30.5	30.5
	1988	28.8	30.2	29.3
	1990	29.4	30.7	29.8
	1991	28.1	29.2	28.7
	1992	28.9	29.3	29.1
	1993	29.3	31.0	30.3
	1994	30.0	32.0	31.1
	1995	30.2	32.5	30.9
	1996	26.5	28.3	27.3
	1997	24.6	25.3	24.9
	1998	23.4	25.2	24.5
	1999	29.3	30.6	30.0
	2000	26.2	27.0	26.5
HYPOLIMNION				
	1987	29.8	29.8	29.8
	1988	28.8	30.1	29.4
	1990	29.3	29.8	29.5
	1991	26.8	30.2	28.7
	1992	28.9	29.8	29.3
	1993	28.7	30.9	30.0
	1994	30.0	31.8	31.0
	1995	29.8	32.4	31.1

Table 6.

ARMINGTON LAKE
PIERMONT

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1996	26.2	28.0	27.1
	1997	23.5	26.5	24.5
	1998	25.2	25.8	25.4
	1999	29.4	30.6	30.0
	2000	26.2	27.0	26.5
INLET				
	1987	29.4	29.4	29.4
	1988	26.2	30.1	28.4
	1990	26.9	26.9	26.9
	1998	18.4	20.7	19.3
	2000	20.4	20.4	20.4
METALIMNION				
	1990	29.2	31.0	30.1
	1992	29.6	29.6	29.6
	1993	30.8	30.9	30.8
	1994	30.5	31.3	30.9
	1995	29.5	31.4	30.4
	1996	28.1	30.2	29.1
	1997	23.5	26.3	24.9
	1998	23.8	23.8	23.8
	1999	32.0	32.0	32.0
	2000	26.5	26.7	26.6
OUTLET				
	1987	30.1	30.1	30.1
	1988	30.5	34.4	32.5
	1990	39.3	103.5	63.2

Table 6.

ARMINGTON LAKE

PIERMONT

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1991	28.3	45.7	37.7
	1992	28.9	28.9	28.9
	1993	38.3	38.3	38.3
	1994	34.7	51.0	42.9
	1995	36.9	36.9	36.9
	1996	32.0	33.4	32.7
	1997	29.9	58.5	44.2
	1998	32.1	33.4	32.7
	2000	32.2	35.4	33.7

Table 8.

ARMINGTON LAKE

PIERMONT

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1987	7	7	7
	1988	5	14	8
	1990	7	15	10
	1991	2	11	5
	1992	4	6	5
	1993	4	9	6
	1994	5	10	7
	1995	4	5	4
	1996	5	9	7
	1997	< 1	9	6
	1998	4	5	4
	1999	1	7	3
	2000	< 5	6	5
HYPOLIMNION				
	1987	6	6	6
	1988	8	9	8
	1990	6	8	7
	1991	4	7	6
	1992	4	6	5
	1993	6	10	7
	1994	7	16	10
	1995	4	12	6
	1996	5	7	6
	1997	2	9	6

Table 8.

ARMINGTON LAKE

PIERMONT

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1998	3	46	18
	1999	1	5	3
	2000	< 5	15	8
INLET				
	1987	2	2	2
	1988	5	9	7
	1990	7	7	7
	1998	1	4	3
	2000	7	7	7
METALIMNION				
	1990	7	9	8
	1992	7	8	7
	1993	4	6	5
	1994	6	8	7
	1995	4	8	6
	1996	4	8	6
	1997	1	10	5
	1998	6	6	6
	1999	6	6	6
	2000	< 5	5	5
OUTLET				
	1987	8	8	8
	1988	7	13	10
	1990	3	9	6
	1991	6	9	7
	1992	80	80	80

Table 8.

ARMINGTON LAKE

PIERMONT

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1993	7	7	7
	1994	11	53	27
	1996	8	9	8
	1997	1	10	5
	1998	3	5	4
	2000	< 5	7	6

Table 9.

ARMINGTON LAKE

PIERMONT

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		August 18, 2000	
0.1	21.0	7.9	88.2
1.0	21.0	7.8	87.5
2.0	20.9	7.8	87.0
3.0	20.8	7.9	88.2
4.0	20.8	7.9	88.4
5.0	20.8	7.8	87.6
6.0	20.6	7.6	84.8
7.0	20.0	7.3	80.5
8.0	17.4	5.3	55.6

Table 10.

ARMINGTON LAKE

PIERMONT

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 27, 1987	8.0	16.5	4.4	44.0
June 2, 1988	7.0	11.9	9.8	92.0
June 12, 1990	6.5	16.0	9.2	93.4
June 17, 1991	8.0	13.1	10.4	98.8
August 12, 1991	9.0	17.0	0.1	1.0
June 22, 1992	8.0	11.9	12.0	110.9
June 9, 1993	8.0	13.5	10.5	99.0
July 21, 1994	8.0	16.5	7.3	74.0
July 13, 1995	8.5	16.5	3.2	32.0
June 18, 1996	8.0	10.8	7.9	69.0
July 29, 1997	7.0	16.8	9.4	95.0
July 28, 1998	7.0	17.6	7.9	81.0
August 18, 1999	8.0	21.3	6.7	75.7
August 18, 2000	8.0	17.4	5.3	55.6

Table 12.

ARMINGTON LAKE

PIERMONT

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
A		
	August 18	0
B		
	August 18	0
C		
	August 18	1
D		
	August 18	1
E		
	August 18	0
F		
	August 18	0

NOTE: "<" means "less than" and ">" means "greater than"